

WHAT IS CLAIMED IS:

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1. A charge transfer apparatus comprising:
a semiconductor substrate of one conductivity
type;
5 a charge transfer region of a conductivity type
opposite to the conductivity type of said semiconductor
substrate that is formed in said semiconductor
substrate and joined to said semiconductor substrate to
form a diode;
10 a signal charge input portion adapted to input a
signal charge to the charge transfer region;
a signal charge output portion adapted to
accumulate the signal charge transferred from the
charge transfer region; and
15 a plurality of independent potential supply
portions adapted to supply a potential gradient to said
semiconductor substrate,
wherein the signal charge in the charge transfer
region is transferred by the potential gradient formed
20 by said plurality of potential supply portions.

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2. An apparatus according to claim 1, wherein the
charge transfer region is completely depleted before
the signal charge is input.

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3. An apparatus according to claim 2, wherein the
charge transfer region is buried in said semiconductor

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substrate and forms a buried diode together with said semiconductor substrate.

5 4. A charge transfer apparatus comprising:
a semiconductor substrate of one conductivity type;

a well of a conductivity type opposite to the conductivity type of said semiconductor substrate that is formed in said semiconductor substrate;

10 a charge transfer region of a conductivity type opposite to the conductivity type of said well that is formed in said well and joined to said well to form a diode;

15 a signal charge input portion adapted to input a signal charge to the charge transfer region;

a signal charge output portion adapted to accumulate the signal charge transferred from the charge transfer region; and

20 a plurality of independent potential supply portions adapted to supply a potential gradient to said well,

wherein the signal charge in the charge transfer region is transferred by the potential gradient formed by said plurality of potential supply portions.

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5. An apparatus according to claim 4, wherein the charge transfer region is completely depleted before

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the signal charge is input.

6. An apparatus according to claim 5, wherein the charge transfer region is buried in said well and forms a buried diode together with said well.

7. An image pickup apparatus comprising:
a semiconductor region of one conductivity type;
photoelectric conversion portions
two-dimensionally arrayed in the semiconductor region;
charge transfer regions of a conductivity type
opposite to the conductivity type of the semiconductor
region that are interposed between respective columns
of the photoelectric conversion portions and form
junctions together with the semiconductor region;
transfer electrodes adapted to transfer and
inputting signal charges to the charge transfer
regions;
signal charge output portions adapted to
accumulate the signal charges transferred from the
charge transfer regions; and
a plurality of independent potential supply
portions adapted to supply a potential gradient to the
semiconductor region,
wherein the signal charges input to the charge
transfer regions are transferred in a column direction
by the potential gradient formed by said plurality of

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potential supply portions.

8. An apparatus according to claim 7, wherein
each charge transfer region is completely depleted
5 before the signal charge is input.

9. An apparatus according to claim 8, wherein the
charge transfer region is buried in the semiconductor
region and forms a buried diode together with the
10 semiconductor region.

10. An apparatus according to claim 7, further
comprising:

a conversion portion, arranged on respective
15 columns, adapted to convert signal charges output to
the signal charge output portions on the respective
columns into electrical signals of an another form; and

a read-out circuit adapted to sequentially read
out the electrical signals on the respective columns
20 and forming an image pickup signal.

11. An apparatus according to claim 10, wherein
said conversion portion converts the signal charge into
an electrical signal of another form and includes an
25 amplifier formed from an insulated-gate field effect
transistor.

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12. An apparatus according to claim 7, wherein said apparatus further comprises:

charge transfer elements adapted to transfer signal charges output to the signal charge output portions on the respective columns; and

conversion portion, connected to final output stages of said charge transfer elements, adapted to convert transferred signal charges into electrical signals of an another form,

wherein the electrical signals from said conversion means are sequentially read out to form an image pickup signal.

13. An apparatus according to claim 12, wherein said charge transfer element includes a CCD.

14. An apparatus according to claim 7, further comprising:

lens adapted to form light into an image on the photoelectric conversion portions;

A/D converter adapted to convert signals from the signal charge output portions into digital signals; and

a signal processing unit adapted to process the signals from said A/D converter.

15. An image pickup apparatus comprising:

a semiconductor region of one conductivity type;

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photoelectric conversion portions
two-dimensionally arrayed in the semiconductor region;

charge transfer regions of a conductivity type
opposite to the conductivity type of the semiconductor
region that are interposed between respective columns
of the photoelectric conversion portions and form
junctions together with the semiconductor region;

signal amplifier portions adapted to amplify and
output signal charges transferred from the charge
transfer regions; and

a plurality of independent potential supply
portions adapted to supply a potential gradient to the
semiconductor region,

wherein the signal charges accumulated in the
photoelectric conversion portions by the potential
gradient formed by said plurality of potential supply
portions are input to the signal amplifier portions via
the transfer regions, and signals amplified by the
amplifier portions are output.

16. An apparatus according to claim 15, wherein
each amplifier portion is formed from a MOS transistor.

17. An apparatus according to claim 15, further
comprising:

lens adapted to form light into an image on the
photoelectric conversion portions;

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A/D converter adapted to convert signals from the
signal amplifier portions into digital signals; and
signal processing means adapted to process the
signals from said A/D converter.

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